

REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-12 are presently active in this case. None of the claims are amended.

In the outstanding Office Action, Claims 1-2, 4, 6-7 and 10 were rejected under 35 U.S.C. §103(a) as unpatentable over Kawato (U.S. Patent Publication No. 2004/0061978) and Shimazawa (U.S. Patent Publication No. 2002/0097537). Claims 3, 8-9 and 11-12 were rejected under 35 U.S.C. §103(a) as unpatentable over Kawato and Shimazawa further in view of Katti et al. (U.S. Patent No. 6,707,084; herein “Katti”). Claim 5 was rejected under 35 U.S.C. §103(a) as unpatentable over Kawato and Shimazawa in view of Hasegawa et al. (U.S. Patent Publication No. 2003/0042903; herein “Hasegawa”).

In response to the rejection of Claims 1-12 under 35 U.S.C. §102(e) and §103(a), Applicants respectfully request reconsideration of these rejections and traverse the rejections, as discussed next.

Briefly recapitulating, Applicants’ Claim 1 relates to a spin-tunnel transistor, including an emitter; a collector formed adjacent to the emitter; a base formed between the emitter and the collector and having a magnetization pinned layer of ferromagnetic material, a magnetization free layer of ferromagnetic material and a nonmagnetic layer between the magnetization pinned layer of ferromagnetic material and the magnetization free layer of ferromagnetic material, the magnetization pinned layer having a magnetization substantially fixed in an applied magnetic field, the magnetization free layer having a magnetization substantially free to rotate under the applied magnetic field, and the nonmagnetic layer being configured to decouple exchange coupling between the magnetization free layer of ferromagnetic material and the magnetization pinned layer of ferromagnetic material; and a tunnel barrier layer of antiferromagnetic material formed between the magnetization pinned

layer of ferromagnetic material and the emitter or between the collector and the magnetization pinned layer of ferromagnetic material and provided with an exchange coupling with adjoining one of the magnetization pinned layer of ferromagnetic material, the magnetization of the magnetization pinned layer of ferromagnetic material ***being fixed by the exchange coupling between the magnetization pinned layer of ferromagnetic material and the tunnel barrier of antiferromagnetic material.*** Independent Claims 7 and 10 recite similar features in the context of a magnetic reproducing head.

As explained in Applicants' specification at page 5, lines 8-10, Applicants' invention improves upon background spin-tunnel transistors, since a large collector current and high magneto-resistance ratio (MR ratio) is provided, with the magnetization pinned layer having a stable magnetization. Furthermore, the tunnel barrier layer of antiferromagnetic material between the magnetization pinned layer of ferromagnetic material and the emitter/collector, provided with an exchange coupling with the adjoining magnetization pinned layer of ferromagnetic material, can ensure a high transmission of electrons, while fixing the magnetization of the magnetization pinned layer.

Turning now to the applied references, Applicants respectfully submit that neither Kawato nor Shimazawa teach or suggest "the magnetization of the magnetization pinned layer of ferromagnetic material ***being fixed by the exchange coupling between the magnetization pinned layer of ferromagnetic material and the tunnel barrier of antiferromagnetic material***" (emphasis added), as recited in Applicants' independent Claims 1, 7, and 10. The reference Kawato, relied upon by the outstanding Office Action to form the 35 U.S.C. §103(a) rejection, clearly explains that the fixed magnetization is caused by a heat treatment,¹ and is not the result of an exchange coupling between two layers, as recited in Applicants' claims.

¹ See Kawato at page 5, paragraph 51, lines 26-44, and in corresponding Figure 8.

In addition, the reference Shimazawa, used as secondary reference to for the above rejection, does not remedy the deficiencies of Kawato. Shimazawa explains that a special pinning layer 50 is used for pinning the magnetization of the ferromagnetic pinned layer 40.² As shown in Figure 1 of Shimazawa, the special pinning layer is in contact with the magnetic pinned layer 40 to pin the magnetization. Shimazawa also explains that the tunnel barrier layer 30 serves for the ferromagnetic tunnel magnetoresistive effect between the ferromagnetic layers 20 and 40, and that the tunnel barrier layer is sandwiched therebetween.³

Therefore, even if the combination of Kawato and Shimazawa is assumed to be proper, the combination fails to teach every element of the claimed invention. Specifically, the combination fails to teach the claimed the magnetization of the magnetization pinned layer of ferromagnetic material being fixed by the exchange coupling. Accordingly, Applicants respectfully traverse, and request reconsideration of, this rejection based on these references.⁴

Applicants also respectfully traverse the obviousness-type rejection based on Kawato and Shimazawa because there is insufficient evidence for a motivation to modify Kawato's differential detection read sensor with two magnetic resistance elements by incorporating Shimazawa's tunnel barrier layer, for the following reasons.⁵

It is believed that the differential detection read sensor with two magnetic resistance elements, taught by Kawato, cannot be modified to arrive at Applicants' invention, since in

² See Shimazawa in paragraphs 42, 43, and 77.

³ See Shimazawa in paragraph 44 and in Figure 3.

⁴ See MPEP 2142 stating, as one of the three "basic criteria [that] must be met" in order to establish a *prima facie* case of obviousness, that "the prior art reference (or references when combined) must teach or suggest all the claim limitations," (emphasis added). See also MPEP 2143.03: "All words in a claim must be considered in judging the patentability of that claim against the prior art."

⁵ See MPEP 2143.01 stating "[o]bviousness can only be established by combining or modifying the teaching of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art," (citations omitted). See also MPEP 2144.08 III stating that "[e]xplicit findings on motivation or suggestion to select the claimed invention should also be articulated in order to support a 35 U.S.C. 103 ground of rejection. . . Conclusory statements of similarity or motivation, without any articulated rational or evidentiary support, do not constitute sufficient factual findings."

Kawato, all the magnetization directions of the ferromagnetic layers 42a, 42b, 44a and 44b *are fixed.*⁶ In addition Shimazawa's magnetization of layer 20 is free.⁷ As explained above, Shimazawa uses the tunnel barrier layer 30 for the ferromagnetic tunnel magnetoresistive effect between the ferromagnetic layers 20 and 40. Accordingly, Kawato does not need a tunnel barrier layer 30 from Shimazawa for this purpose, since the magnetization of the ferromagnetic layers are fixed and cannot be pinned by other layers. Therefore, such modification would require a substantial reconstruction or redesign of the elements of Kawato, and/or would change the basic principle of operation of Kawato. There is no evidence that a person of ordinary skill in the art would be motivated to perform such changes and redesign.⁸

In addition, Applicants also believe that a person of ordinary skilled in the art would not have been motivated to modify Kawato's differential detection read sensor. The outstanding Office Action states that "it would have been obvious ... to modify the device of Kawato by incorporating a tunnel barrier layer to allow electrons to pass through while keeping the spinning by the tunnel magneto resistive element and to reduce resistance of the element as taught by Shimazawa."⁹ Applicants respectfully disagree with such statement, since Kawato does not need these features identified by the outstanding Office Action to keep "the spinning by the tunnel magneto resistive element," as explained above.

In rejecting a claim under 35 U.S.C. §103(a), the U.S.P.T.O. must support its rejection by "substantial evidence" within the record,¹⁰ and by "clear and particular" evidence¹¹ of a

⁶ See Kawato at page 5, paragraph 51 and in Figures 7-8.

⁷ See Shimazawa in paragraph 44 and in Figure 3.

⁸ See In re Ratti, 270 F.2d 810, 813, 123 USPQ 349, 352 (reversing an obviousness rejection where the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate.")

⁹ See the outstanding Office Action at page 3, lines 15-19.

¹⁰ See In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769 (Fed. Cir. 2000) (holding that, consistent with the Administrative Procedure Act at 5 USC 706(e), the CAFC reviews the Board's decisions based on factfindings, such as 35 U.S.C. § 103(a) rejections, using the 'substantial evidence' standard because these decisions are confined to the factual record compiled by the Board.)

suggestion, teaching, or motivation to combine the teachings of different references. As discussed above, there is no substantial evidence, nor clear and particular evidence, within the record of motivation for modifying Kawato differential detection read sensor by incorporating Shimazawa's tunnel barrier layer. Without such motivation and absent improper hindsight reconstruction,¹² a person of ordinary skill in the art would not be motivated to perform the proposed modification, and Claims 1-12 are believed to be non-obvious and patentable over the applied references.

Regarding the rejection of Claims of dependent Claims 3, 5, 8-9 and 11-12 under 35 U.S.C. §103(a), since the rejection of independent Claims 1, 7 and 10 is believed to be overcome, the rejection of dependent Claims 3, 5, 8-9 and 11-12 is also believed to be overcome. Furthermore, the applied references Katti and Hasegawa do not remedy the deficiencies of Kawato.

Katti describes a magnetic memory cell adding an antiferromagnet,¹³ and is also silent on the claimed tunnel barrier layer. The reference Hasegawa is concerned with magnetic detection device using a free magnetic layer. A layer on the end portions of the free magnetic layer have antiferromagnetic characteristics, so that the magnetization of the free magnetic layer is fixed.¹⁴ Accordingly, Hasegawa is also silent on the claimed tunnel barrier layer.

Therefore, even assuming *in arguendo* that the combination of Kawato with Katti and/or Hasegawa is proper, the combination fails to teach every element of the claimed invention. Specifically, the combination fails to teach the claimed tunnel barrier layer.

¹¹ See In re Dembiczak, 175 F3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999) ("We have noted that evidence of a suggestion, teaching, or motivation to combine may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem to be solved, although 'the suggestion more often comes from the teachings of the pertinent references.' The range of sources available, however, does not diminish the requirement for actual evidence. That is, the showing must be clear and particular.")) (emphasis added).

¹² See MPEP 2141, stating, as one of the tenets of patent law applying to 35 USC 103, that "[t]he references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention."

¹³ See Katti in the Abstract.

¹⁴ See Hasegawa in the Abstract, and in Figure 1.

Accordingly, Applicants respectfully traverse, and request reconsideration of, this rejection based on these patents.¹⁵

Consequently, in view of the present Request for Reconsideration, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 1-12 is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact Applicants' undersigned representative at the below listed telephone number.

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¹⁵ See MPEP 2142 stating, as one of the three "basic criteria [that] must be met" in order to establish a *prima facie* case of obviousness, that "the prior art reference (or references when combined) must teach or suggest all the claim limitations," (emphasis added). See also MPEP 2143.03: "All words in a claim must be considered in judging the patentability of that claim against the prior art."